EXHIBIT

I

Hostage Exchange in Venture Capital Networks

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Abstract:

As part of the modern equity capital market, venture capital often finances the riskiest, most innovative ventures. It is also among the more "primitive" sectors of the market, subject to little regulatory oversight and few formal institutions. Yet venture capital investors thrive in this environment, cooperating in investment syndicates despite extreme moral hazard. This paper examines historical venture capital data to understand how informal networks grew and stabilized. The analysis suggests that, as expected, repeated interactions help hold networks together, but these are assisted by "hostage exchange": venture capitalists take turns as leader and follower in successive deals where, as followers, they are vulnerable to cheating by the leader. Taking turns makes this vulnerability symmetric. The use of hostages has been proposed in theory, but real-world examples have been hard to find. Venture capital syndicates provide a unique setting in which symmetric vulnerability is easily accomplished.

I.   Introduction

Venture capital finances risky new firms and seems to have played an important role

fueling technological innovation. Understanding the institutions that support venture

capital investment is therefore useful to the study of entrepreneurship and economic

development. Taken as a whole, venture capital investment is carried out by a well-

functioning network of venture capital firms, where for any given deal, two or more

venture capital firms invest together: a syndicate. But this wasn't always the case,

because while syndication offers venture capitalists many benefits, it also involves

extreme information problems, or agency problems. It has been the job of venture

capitalists over the past thirty or forty years to overcome these problems and, in the

process, create an important organizational innovation in its own right, the venture capital

network.

How did venture capitalists address agency problems and form this network? Economic

theory suggests that, in general, reputation and repeated interaction should help. Also,

because venture capitalists partner with each other, hostage exchange—in which partners

switch roles and thus vulnerabilities—may also be important. This paper examines data

from the 1970's, the early years of Silicon Valley venture capital investing, to try to

observe network formation. Using a simple two-period model, I look for ways in which

behavior in the first period might have affected behavior in the second period.

I find evidence that both repeated interaction and hostage exchange contribute to network

formation—and do not try to look at reputation because the venture capital firms were

mostly too new to have had a track record. The hostage exchange behavior occurs within a complex, multi-lateral arrangement and offers a unique, real-life example of hostage posting to secure transactions. However, the hostage logic does not seem to be used by West Coast venture capitalists. This raises two issues.

First, might the hostage exchange logic used by East Coast venture capitalists also apply to the more-formal capital market institutions of the East Coast, like stock exchanges, investment banks, etc.? If so, this logic could inform an alternative interpretation of financial activities now under regulatory scrutiny, such as insider trading and IPO (initial public offering) allocations. Second, this leaves open the question of how West Coast venture capitalists formed their very active and effective investment network; a question that more data over additional time periods might be able to address.

II.   Venture Capital Investing and Syndication Networks

The venture capital literature is extensive and diverse. Because venture capital finances innovative start-ups for spectacular returns, it is of interest to the lay public as well as to scholars in finance, economics, sociology, and entrepreneurship; all for a variety of overlapping reasons. While this overview of the literature will certainly be incomplete, it will try to provide a sense for how this paper fits within a broader body of research.

A. The Role of Venture Capital

One reason for the widespread interest in venture capital must undoubtedly include the sheer volume of money and activity related to venture capital businesses. For example, venture-backed start-ups include Apple Computer, Microsoft, Intel, and Google, whose

products have changed our very way of life. By the year 2000, 20% of publicly traded

firms were once financed by venture capital (Gompers and Lerner, 2001), and venture

capital accounts for as much as 8% of patented innovations throughout the 1980s, 14% in

the 1990s (Kortum and Lerner, 2000). Yet venture capital investing is itself a relatively

recent innovation.

The history of chemicals offers an interesting counterfactual to today's venture capital

market (Da Rin, 1998) and shows what a long way the financing of innovation has come.

In the late 19th century, chemicals were a high-tech industry with enormous profit

potential. But chemicals required some technical knowledge, knowledge which bankers

and investors lacked. Consequently, while all industrial securities were considered risky,

chemical companies were considered extremely so. Unable to obtain external finance,

chemical and pharmaceutical companies instead had to rely on wealthy founders and the

companies' own internal resources. Thus companies including Abbott Laboratories, Ely

Lilly, Upjohn, Co., and Squibb, all started out as small, family-owned firms.

B. Agency Problems: VC—Entrepreneur

Why all the investor angst? The same reason entrepreneurs have had trouble financing

innovation since time immemorial: information asymmetry. The general problem of

information asymmetry is that an employee has information his employer lacks,

especially relating to how good a worker he is and how hard he tries (i.e. hidden

information and hidden action or moral hazard). The employer, knowing only the

employee's output, cannot say for sure whether the employee is talented, hardworking, or

lucky. In the chemical industry's case, for example, another problem could be added to

the investor-as-employer's problem: the entrepreneur (employee) also knows more about the technology and markets.

Venture capitalists have overcome these information problems in a number of ways. First, venture capitalists tend to be well-informed about technology and technology markets. Most Silicon Valley venture capitalists worked as engineers in technology companies and maintain connections to industry. Next, venture capitalists stipulate control rights, including the hiring and firing of managers. Ferguson (1999) gives a first-hand account of his difficulties as an entrepreneur trying to obtain venture capital. His two conflicting fears were (1) not getting funding in time and (2) getting funders who then fire him from his own company. Meanwhile, the venture capitalist worried that Ferguson might be a lousy engineer, a slacker, or might run off to a competitor.

In any case, the hiring and firing rights are just one way venture capitalists address agency problems vis-à-vis entrepreneurs. Venture capitalists also serve on the entrepreneur's board of directors (Lerner, 1995), dole out money in stages as the start-up grows, reserving the right to abandon the start-up (i.e. staged financing) (Gompers, 1995), and use convertible securities to prevent entrepreneurs misrepresenting the start-up's prospects (Cornelli and Yosha, 2003). Kaplan and Stromberg (2003), in their study of venture capital contracts, find various combinations of these and other contract provisions, including anti-dilution protection, conditions under which venture capitalists relinquish control (automatic conversion of preferred shares to common shares), vesting and non-compete clauses for entrepreneurs. Also, contracts in their sample seem to

respond to information, so repeat entrepreneurs, about whom venture capitalists have

some information about quality, face weaker restrictions than first-timers, for example.

C. Agency Problems: Limited Partners—VC

Solving some of the venture capital-entrepreneur agency problems probably helped early

venture capital firms, in the mid-1940s through the 1960s. For venture firms like Venrock

(started by the Rockefeller family) or Sprout Group (an arm of investment bank DLJ),

these particular problems might have been the main hurdle to investing in and managing

risky start-ups, because investment capital was generated by other businesses. But for

other venture funds, including ARD founded in 1946 by MIT professors, it was necessary

to raise capital from outside sources. ARD tried to raise money on the public market, but

today, capital is most commonly raised from institutional investors including pension

funds, etc., and wealthy individuals (limited partners).

The raising of capital creates another agency problem, this time for the venture capitalist-

as-employee. Now, the venture capitalist has information that his investors ("employers")

lack, so the venture capitalist must somehow reassure and give up control rights.

A recent case of fraud illustrates how real this problem is for investors (Smith, 2004).

Gregory Earls promoted himself among affluent fellow-Harvard parents as an investment

manager. Over a period of four years, he raised $20 million from sophisticated investors

including pension funds and former entrepreneurs. He was recently found guilty of

misappropriating $13.8 million of that, mostly to his own private accounts and trusts for

his children. The investor-investment manager agency problem is alive and well.

In the case of venture capital firms, contractual controls help mitigate some of the investor's problems. Gompers and Lerner (1996) discuss covenants, or contractual limitations on how the venture capitalists (general partners) should be compensated, what types of start-ups the fund can invest in, and what outside activities general partners can engage in (e.g. to avoid conflicts of interest). But these covenants are expensive to monitor and appear inconsistently among limited partner contracts. Instead, something else seems to facilitate limited partnership—perhaps repeated interaction, social ties, or the like—because limited partners typically draw from the narrow ranks of family, close friends, and others who have shown a hands-off patience. These ranks are destined to remain closed, judging by the public impatience and distrust most ordinary people have for secretive, long-term commitments like venture capital investing.[1]

D. Agency Problems: VC—VC

To move from the individual venture capital firms of the 1950s to today's venture capital network requires some cooperation or interaction among venture capitalists. This is partly driven by the venture capitalist's problem, optimizing his *portfolio* of investments. Because venture capitalists are not merely passive suppliers of capital but rather active managers (spending half their time monitoring their start-ups (Sahlman, 1990)),

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[1] ARD was a publicly traded fund whose individual investors didn't understand the risks and time horizon involved with venture investing (Gompers and Lerner, 2001). After a few other venture capital funds made equally unsuccessful attempts, venture funds came off the public markets. Until June 2000, when already-successful Silicon Valley venture capitalist Tim Draper opened a new fund to the general public, ostensibly to make the spectacular returns of venture capitalists and their elite network available to ordinary investors (McGee, 2000). Almost three years later, shares in "meVC" were trading at $8, down from its issue price of $20 (and less than the $11.84 per share net asset value). Shareholders ousted Draper and the fund's existing management (Grimes, 2003). Finally, the recent bear market has led to calls for public pension funds and universities to disclose venture capital holdings and current performance (Marshall, 2003). Venture capitalists warned that public disclosures of confidential information could jeopardize investments and that investors making public disclosures would be left out of future funds. Thus far, the University of California has refused to release information even though its endowment fell by over 10% in 2002.

managerial talent is a scarce resource. If a venture capitalist could invest only in those start-ups that he could also manage, he would only be able to invest in a handful of firms at any given time. To get around this production constraint, venture capitalists syndicate investments, i.e., invest with other venture capitalists in a start-up, with one venture capitalist taking the lead role in actively managing the start-up.

The ability to diversify a portfolio without diluting managerial attention would be reason enough to syndicate investments. But several other benefits accrue from syndication including risk-sharing (Wilson, 1968); diversification of expertise, increasing investment size, and liquidity constraints (Brandner, Amit, Antweiler, 2002); better investment decisions as independent parties evaluate a new firm, and controlling opportunism by fellow investors (Lerner, 1994).

Of course, the asymmetry of information between the lead investor and other investors presents yet another agency problem, this time among fellow venture capitalists. As with the other agency problems above, we might expect contracts, repeated interaction and social ties to help. But because venture capitalists are now dealing with other venture capitalists, it may be possible to make the asymmetric information problem symmetric through role reversal. That is, when a venture capitalist serves as lead investor, he has the informational advantage over the follower. These two venture capitalists can switch roles in a second syndicate, so that the follower in the first deal serves as lead in the second deal. This symmetric vulnerability, or hostage exchange, gives both parties an additional incentive to deal honestly. The idea of hostage exchange was proposed by Williamson

(1996) but real-life examples, in which buyers and sellers are equally vulnerable to some sort of hazard, whether hold up or moral hazard, have been hard to identify. The easy reciprocity of venture capitalists provides a nice situation for observing hostage exchange in action.

In addition to the economics literature on syndicates, the sociology literature has examined the networks that result from extensive syndication. Sorenson and Stuart (2001) describe the way in which syndicates have helped strengthen venture capital networks that then disseminate information. Piskorski (2002) and Ferrary (2001) argue that networks are built upon reciprocity within the syndicate relationship. Piskorski finds that the rule of reciprocity depends upon the relative centrality or power of venture capitalists within the network; Ferrary focuses on the notion of gift exchange for gaining entry into an established network. While these studies have examined well-established networks, Castilla et al (2004) and Wilson (1985) describe the genealogy of venture capitalists and their professional network.

This paper takes into account the notion that network dynamics can change over time (Powell, et al, 2004), such that the historical period of network formation may have been built upon a different logic than today's network behavior. This study will draw upon both economic theory and a sociological approach in trying to understand how today's venture capital network came to be.

III.   Data

The 1970s exhibited a rapid growth in syndication activity. In 1970, a quarter of financings were syndicated; by 1980, over half were (Figure 1). I use data from this time period, but two important caveats must be noted. First, the data, from Venture Xpert (one of two privately compiled databases of venture capital investments) are much less complete for the 1970s than for the 1980s on. Venture capital firms do not make public filings with any regulatory agency, and so the database is essentially a sample. Second, the period I focus on, the first half of the decade, may be somewhat unusual. The early 1970s follow a market downturn and include the oil price rise of 1974. That said, venture capitalists tell me that a market downturn is the best time to make venture capital investments. In any case, these problems are worth keeping in mind when interpreting the results that follow.

In the first three years of the decade, 1970-2, 150 venture capitalists are recorded as having made at least one investment. I track this cohort over the first half of the 1970s to try to observe behavioral changes. Given the brief account above, it's not surprising that most of the venture capitalists are from the East Coast, with only 16 firms based in Silicon Valley (Table 1). Also not surprising, most are venture capital firms (designated "Private Firm Investing Own Capital"), though some are also individuals, or offshoots of investment banks and large companies (Table 2).

Most of the investors in the cohort are active, with only 17 exiting (i.e. they did not reappear in the data through 1980) and a majority (79) investing more or less constantly

despite the downturn (Figure 3). As far as syndicates go, most firms want to at least try it

out; 123 invest as part of a syndicate, but 57 do so only once and another 24 just twice

(Table 3). This means that many of the syndicates involved a small number of repeat-

syndicators. Just 42 investors participated in more than two syndicates, and 10 took part

in ten or more, including venture capital firms Sprout, Charles River, TA Associates and

Mayfield Fund; investment banks Hambrecht&Quist, and Rothschild; and venture arms

of commercial banks BankAmerica, Citicorp, First Chicago and BancBoston.

IV.   Model and Analysis

How did networks form from these modest beginnings? I take a sociological approach in

the sense that I suppose that networks are built upon syndicate relationships (e.g.

Sorenson and Stuart, 2001) and focus on dyads or venture capitalist pairings (e.g. Powell

et al, 2004). I propose a simple two-period model that examines the relationship between

period 1 behavior and period 2 behavior, where period 1 is the three-year period 1970-2

and period 2 is the following three-year period, 1973-5. In particular, I ask, does dyad

formation in period 1 affect dyad formation in period 2? For example, we might expect

two investors who paired several times in period 1 to pair again in period 2 because they

were a good match, had a chance to evaluate each other in period 1, and valued future

interaction which would prevent shirking. The empirical approach is thus a comparison

of period 2 pairing (dependent variable) with period 1 pairing, where the unit of analysis

is the dyad, or venture capitalist pair.

In period 1, 123 of 150 venture capitalists participated in at least one syndicate. These

123 investors created 386 different dyads, of which the vast majority, 340, paired only

once (Table 5, panel 1). Most of these one-time-only dyads don't re-pair in period 2, with only 19% forming a dyad again. Compare this with the 46 dyads that do at least two deals in period 1. More than half of these dyads form again in period 2. There are several possible reasons for this pattern of dyad formation, in which more period 1 deals seem to make period 2 deals more likely.

A. Mutual Attraction

First, it's quite reasonable that venture capitalists who are a good match for each other should pair more often on an ongoing basis. "Quality" is one reason for a good match; smart, well-connected investors like to work with other smart, well-connected investors. According to anecdotal evidence, the venture capitalist's biggest problem in the 1970s was finding good businesses in which to invest, so one proxy for quality might be the number of deals an investor does in a given period. That is, a "good" venture capitalist would be one who consistently found many investment opportunities. In the period 1 data, the number of deals venture capitalists did ranged from 1 to 36.

I look to the data for some empirical proxies for quality, applying a simple logit model to period 1 dyads. I ask, which firm-specific characteristics bring partners together, where the dependent variable is whether two investors partnered at all in period 1. Not surprisingly, I find that the number of deals an investor does in period 1 is significant. Also, leadership seems to be a good indication of quality. Finally, investors like to partner with others in their state (Table 4).

B. Repeated Interaction

Another possible explanation for the pattern of syndication observed above is the "shadow of the future." An investor who values future deals with his partner is less likely to jeopardize that future by shirking or behaving opportunistically. The partner knows this and so "trusts" the partner enough to do a deal in the current period. Thus, the number of deals two investors do together in period 1 might be one indication of how valuable two partners are to each other in the future and therefore the amount of "trust" each has in the other. The more trust there two partners have developed in period 1, the easier it is to do a deal in period 2.

C. Deal Structure

Can the *structure* of a dyad's deals help explain period 2 pairings? Seven dyads swapped leadership roles and another 34 dyads invested as equals in period 1. Of these 41 dyads, only 30% paired again in period 2. So the swapping of leadership does not seem particularly helpful in securing future deals between partners.

However, I consider an extension of the hostage exchange idea: multilateral hostage posting. In principle, hostages can be used to secure deals within multilateral arrangements. The simplest illustration of this multilateral case is a medical one (Kohn, 2003). Three kidney transplant patients in Baltimore each had a family member willing to donate a kidney, but each of the donors' kidneys was incompatible with his family member's. By chance, each donor was compatible with one of the other two patients, so everyone could have a kidney. Observe that if any of the donors reneged, all of the

transplants could be called off. Note also that this multilateral arrangement created a flexibility, opening up new options, that proved essential to the kidney patients.

To detect such multilateral relationships in the data requires some detailed manual analysis. Fortunately, the relatively small amount of data from the early 1970's makes this possible. Table 6 is a period 1 illustration of a "kidney transplant" arrangement in the venture capital context. Five investors (A, B, C, D, and E) take part in five syndicates (1, 2, 3, 4, and 5). Investor A leads the syndicate for Start-up 1, with Investors B and E investing as less-informed "followers". If this deal were considered in isolation, then A is in a position to cheat his partners, B and E, because A has more information, and B and E cannot observe A's effort.

However, add to this deal syndicate 5, in which E leads A. Now that E and A have swapped roles, they can cheat each other. This role reversal gives both E and A an incentive to inform the partner. Suppose start-up 1 goes belly-up, as nine out of ten start-ups do even with talented and hardworking investors. If E thought A had cheated him of his investment, he would cheat A of his investment in return. A knows this but wants E to believe A was honest so that E will return a rightful return on A's investments. So A wants to give E as much information as possible to persuade E that he hasn't been cheated.

So because A and E swap leadership roles in start-up 1 and 5, they hold each other hostage. But investor B is still vulnerable to A. Consider deals two, three, and four. B

leads C in deal 2. C leads D in deal 3, and D leads E in deal 4. Now, like in the kidney situation, if A cheats B, B can withhold C's return, who can withhold D's return, who can withhold E's return, who can withhold A's return. That is, B can *induce* punishment of A through a series of transactions. In the end, all five investors have the power to keep all other investors honest.

Notice that this is a highly structured arrangement. Also, most of the investor pairs need only pair once to make the whole structure work. This makes looking for such arrangements in the data difficult, but it also makes for a very flexible arrangement because a few transactions secure a large variety of possible transactions. For example, investor B makes only two investments in this scheme, one with A and one with C. Having done so, it can now transact with the D and E knowing that it can induce punishment should either renege.

Figure 4 shows the hostage network I identify from period 1. Is this a chance arrangement, or did investors recognize the usefulness of such hostage posting? Table 4 shows that there were 30 pairings within hostage networks. Of these, 21, or 70% paired again in period 2. Certainly, the descriptive statistics in Table 5 suggest that this highly structured hostage arrangement had well-understood cheat-reduction properties.

D. Statistical analysis

To see whether the factors above explain the pattern of behavior described in Table 4, I apply a logit model to the data, where dyad formation in period 2 (yes/no) is the dependent variable. That is, is period 2 dyad formation somehow influenced by the set of

possible factors listed above, such as investor quality or matching, repeated interaction, and hostage posting? The results (Table 7, Panel 1) are perhaps not so surprising, given the descriptive statistics in Table 4. First, investor quality matters: investors who do lots of deals in period 1 tend to pair in period 2. Also, investors from the same state tend to pair. But repeated interaction does not seem to have the positive effect we had expected, after controlling for quality or matching, while posting a hostage in period 1 does result in a greater period 2 re-pairing rate.

Perhaps a combination of hostage posting and repeated interaction are used to forge bonds. In a second model, I interact the two variables and find that period 1 deals and hostage posting alone do not improve the likelihood of pairing in period 2, but doing both does so (Table 7, Panel 2).

V.   Discussion and Conclusion

How did venture capital networks, now so taken-for-granted, form? The economic theory of asymmetric information predicts a high hurdle for investor cooperation; indeed, in the early 1970s, syndication of venture capital investments was a mere 25% of all deals. I examine 30-year-old venture capital data to try to understand how investors might have addressed the information problems, especially moral hazard.

I find that a small network of investors structured deals in the early 1970s such that members had an incentive to be honest with one another. The price of entry into this "club" was a hostage, an investment as a follower with another member of the club. Hostage exchange is proposed by Williamson (1996), but real-life examples are rare; it is

difficult to think of a buyer-supplier situation in which both parties can be made vulnerable to the other. Venture capital syndicates provide just such an situation because the symmetry is simple: both parties can act as leader or follower.

But as reasonable as the results may seem—that high quality venture capitalists attract one another, do deals together repeatedly and secure these deals with hostages—there seems to be a difference between East Coast behavior and West Coast behavior. Notice that all but one of the members of the fledgling, hostage-based club are East Coast firms. West Coast firms do not appear to post hostages while nevertheless doing deals together repeatedly. Figure 5 shows the interaction of West Coast firms, and Table 4 gives descriptive statistics for period 2 pairing among West Coast firms. Of the dyads that did at least two deals in period 1, 70% formed again in period 2 without posting hostages.

What accounts for this difference between East and West Coast behavior? One possibility is data; only 10% of the venture capitalists in period 1 data are West Coast firms. Another possibility, suggested by a West Coast practitioner active in the 1970s, is cultural; the East Coast was much more "cut-throat" while the West Coast was very small and newcomers were welcomed and encouraged. Perhaps this cultural difference arises from the distinct traditions out of which venture capital investing arose, financial on the East Coast and engineering on the West Coast. In any case, this paper suggests, without explaining, another on a growing list of differences between East and West Coast innovation styles, including R&D (Saxenian, 1996) and stage of venture capital investing (Gompers and Lerner, 1996).

Nevertheless, the use of hostages by at least the "cut-throat" financial types from the East Coast does raise the possibility that the logic of hostages might apply to more formal capital market institutions. For example, observers have noted that the NYSE, with its nonprofit, member-owned governance structure, is something of a "club". So, suppose that accounting fraud can often be hard to detect and even NYSE-listed firms could cheat investors (not much of a stretch given the latest scandals). A hostage arrangement among owners of exchange-listed firms would keep owners honest—at least among themselves. Thus, insider-trading scandals take on a certain logic, where owners keep other owners informed of the latest, stock-price-related news. IPO allocations would also get a new interpretation under the hostage theory, where an IPO allocation is an obligation— members extracting a hostage—rather than a perquisite for good customers.

Finally, the finding that hostage posting behavior works raises the question why are there so few venture capital networks in the world. The hostage arrangement does not require formal contracting, so legal institutions could, in principal, be weak and hostages could still be used. What prevents investors in other parts of the world from structuring networks in this way? Separately, since the successful triple kidney transplant mentioned above, changes are being discussed for allowing kidney patients who find donors to move up on a waiting list. Further research could explore the possible tradeoffs and intermediation that surround hostage posting.

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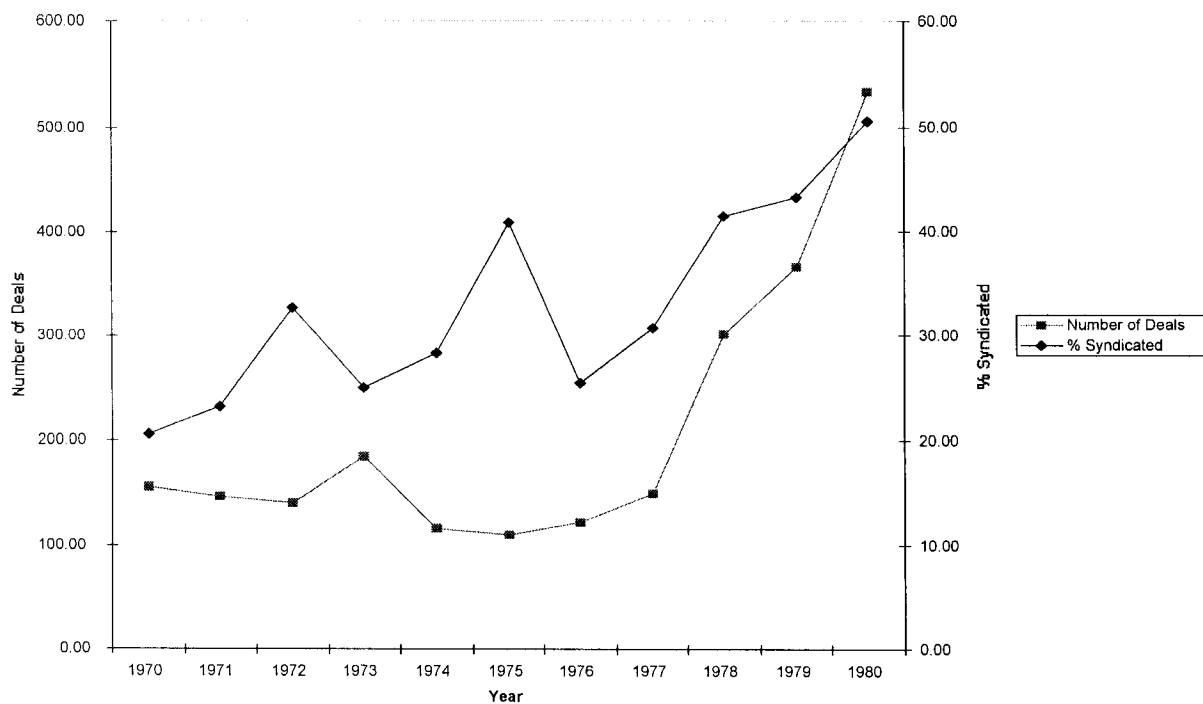Figure 1: Total Venture Capital Deals, 1970-1980

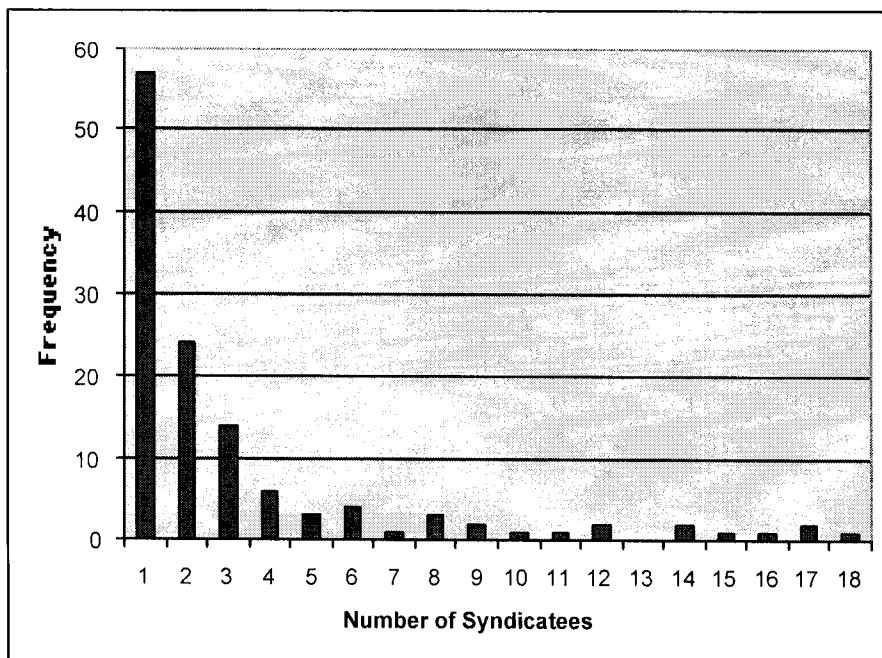Figure 2: Frequency of Investors Participating in Syndicates

Figure 3: Frequency of Firms' Time to Next Transaction After 1970-2
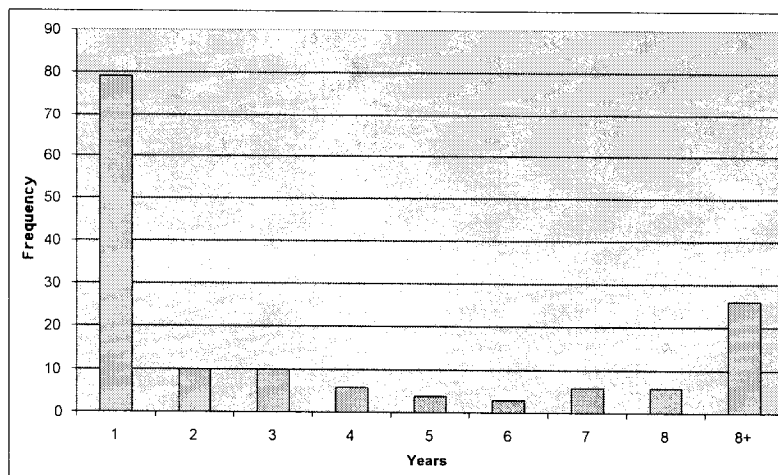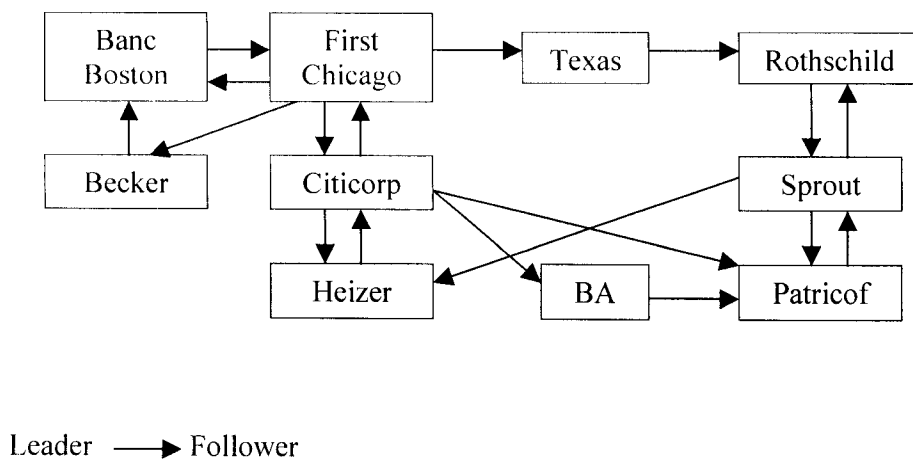
Figure 4: A Multilateral Hostage Arrangement, 1970—1972
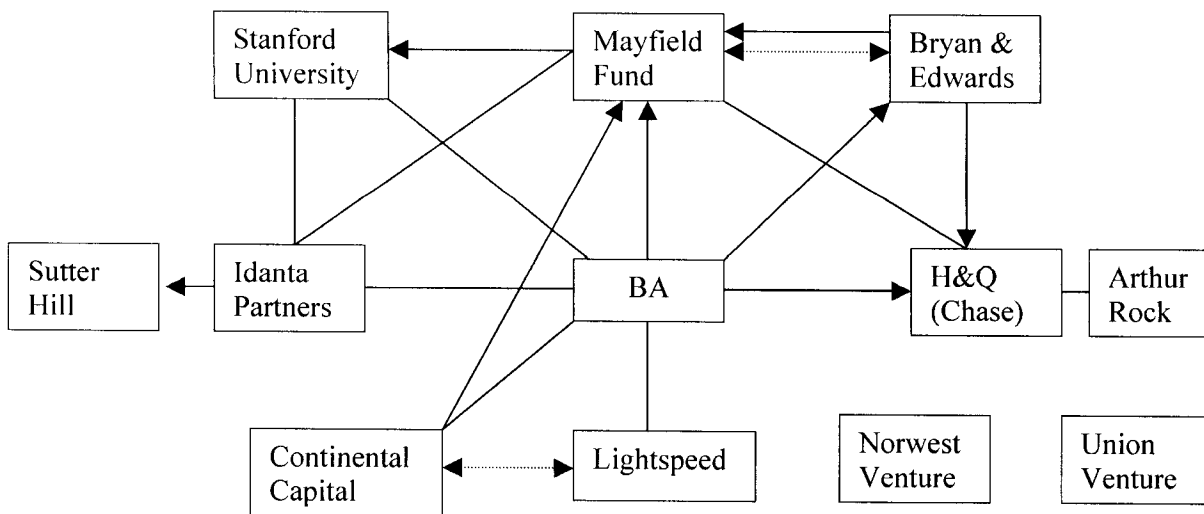

Leader ——▶ Follower

Figure 5: The California Network, 1970-1972

Table 1: Frequency of Geographical Region among Venture Capital Firms, 1970-2

Region	Frequency
Greater New York	51
New England	21
N. California	16
Southeast	14
Great Lakes	13
Great Plains	7
S. California	5
Mid-Atlantic	4
Ohio Valley	4
South	4
Non-US	3
Canada	1
Rocky Mountains	1
Unknown	6

Table 2: Frequency of Firm Type among Venture Capital Investors, 1970-2

Type of Investor	Frequency
Private Firm Investing Own Capital	64
Non-Financial Corp. Affiliate or Subsidiary	18
Investment/Merchant Bank Subsid/Affil	16
SBIC Not elsewhere classified	15
Affiliate/Subsidary of Oth. Financial. Instit.	11
Insurance Firm Affiliate or Subsidiary	6
Commercial Bank Affiliate or Subsidiary	5
Investment Management/Finance Consulting	4
Endowment	3
MESBIC not elsewhere classified	3
Individuals	3
Private Equity Advisor or Fund of Fund Mgr	1
Pension Fund-Public	1

Table 3: Descriptive Statistics for 1970-1972:

Number of Investors	150
Exited	26
Participated in a Syndicate (1970-2)	123
Total Dollar Amount Invested ($000)	$710,316
Total Rounds of Financing	1480
Number of New Start-ups	349
Amount Invested in New Start-ups ($000)	$239,426

Table 4: Frequency of Period 1 and Period 2 Pairings

	All Venture Capitalists		"California Network"	
Period 1 Pairing Arrangement	Pairs in Period 1	% "Re-pairings" in Period 2	Pairs in Period 1	% "Re-pairings" in Period 2
One Pairing Only	340	19%	7	29%
2+ Pairings	46	54%	10	70%
Swapped or Joint Leadership	41	30%	2	100%
Hostage "Posting"	30	70%	N/A	N/A

Table 5: Logit regression of firm-specific characteristics on pairing between investors

Independent Variable: Period 1 Dyad Formation	
Number of Deals (VC1)	0.052*** (0.01)
Number of Deals (VC2)	0.083*** (0.01)
Leader Behavior (VC1) y=1	0.30*** (0.12)
Leader Behavior (VC2) y=1	0.37** (.014)
Same State (y=1)	0.48*** (0.15)
Chi sq Statistic for Investor Type Fixed effects	38.19***
Pseudo R-Squared	0.1132
Number of observations	7381

Table 6: Multilateral Hostage Situation

Start-up	Investors				
	Heizer (A)	Sprout (B)	Rothschild (C)	First Chicago (D)	Citicorp (E)
(1) Paradyne	L	F			F
(2) Archon		L	F		
(3) Detwiler			L	F	
(4) Entrex				L	F
(5) Data 100	F				L

F = Follower   L = Leader

Table 7: Logit regression of period 1 interactions on period 2 pairing

Independent Variable: Period 2 Dyad Formation	Model 1	Model 2
Number of Deals Done by a Pair in Period 1	-9.71*** (0.90)	-11.23*** (1.03)
Hostage Posting (y=1)	1.22* (0.64)	-2.15** (0.85)
Number of Deals by Pair in Period 1*Hostage		8.99*** (1.95)
Number of Deals (VC1)	1.43*** (0.38)	1.47*** (0.39)
Number of Deals (VC2)	0.82** (0.33)	0.94** (0.34)
Leader Behavior (VC1) y=1	0.44 (0.29)	0.48 (0.30)
Leader Behavior (VC2) y=1	0.41 (0.31)	0.42 (0.32)
Same State (y=1)	0.52* (0.28)	0.59* (0.29)
Chi sq Statistic for Investor Type Fixed effects	24.11**	23.52**
Pseudo R-Squared	0.34	0.36
Number of observations	563	563